Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Presently Amended) A local network-capable device adapted for collaborative operation and communication over a network with at least one remote network-capable device to enable the local network-capable device and the remote network-capable device to cooperatively edit the same data, said local network-capable device comprising:

A) a memory for storing a local copy of the data in accordance with a data model;

B) a data-change engine coupled with the memory, and responsive to a plurality of data change requests, for controlling storage of the local copy of data in the memory in accordance with the data model and making changes to the local copy of the data; the data change requests including a locally-generated data change request and a remotely-generated data change request; and

C) a dynamics manager, coupled with the data-change engine, and responsive to the data change requests for controlling the engine and coordinating execution of the data change requests; wherein the dynamics manager, responsive to the data change requests, can cause the making of selected data changes in an order, and, responsive to a data change request being received out of the order, the rolling back undoing of the selected data changes to a point where a data change corresponding to the out-of-order data change request should have been made and the remaking of the selected undone data changes in another order so that the local copy of the data is consistent with a copy of the data maintained by the remote network-capable device.

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1   2.   (Presently Amended) The local network-capable device in accordance with claim

2   1, wherein the dynamics manager causes making, ~~rolling back~~ undoing and

3   remaking of data changes in response to a data change request priority scheme.

1   3.   (Original) The local network-capable device in accordance with claim 1, wherein

2   the data change request priority scheme includes encoding the data change

3   requests with request sequence numbers, and the dynamics manager is

4   responsive to the request sequence numbers in determining an order for making

5   data changes specified by the data change requests.

1   4.   (Original) The local network-capable device in accordance with claim 3, wherein

2   the data change request priority scheme includes encoding the data change

3   requests with an identifier corresponding to a characteristic of the network-

4   capable device that generated the request, and the dynamics manager is

5   responsive to the identifier in causing making of data changes.

1   5.   (Original) The local network-capable device in accordance with claim 4, wherein

2   each network capable device and a user thereof corresponds to an endpoint, and

3   the identifier comprises an endpoint number corresponding to the endpoint that

4   originated the data change request.

1   6.   (Original) The local network-capable device in accordance with claim 5, wherein

2   the request sequence numbers comprise endpoint relative sequence numbers,

3   and the dynamics manager causes the data change requests to be processed in

4   an order dependent on the endpoint relative sequence numbers and the endpoint

5   numbers.

1   7.   (Presently amended) The local network-capable device in accordance with claim

2   3, wherein the data change request priority scheme includes a dependency

3

3   identifier in each data change request, and the dynamics manager is responsive

4   to the dependency identifier in causing ~~rolling back~~ <u>undoing</u> and remaking of data

5   changes.

1   8.   (Previously amended) The local network-capable device in accordance with

2   claim 7, wherein the dependency identifier specifies at least one data change

3   request on which the encoded data change request depends.

1   9.   (Original) The local network-capable device in accordance with claim 8, wherein

2   the dependency identifier specifies one data change request on which encoded

3   data change request depends.

1   10.   (Original) The local network-capable device in accordance with claim 8, wherein

2   the dynamics manager executes do, undo and redo operations with respect to

3   data change requests to ensure that each one of the data change requests is

4   processed only after the specified data change request on which the one data

5   change request depends has been processed.

1   11.   (Presently Amended) The local network-capable device in accordance with claim

2   8, wherein

3   A)   the request sequence numbers comprise endpoint relative sequence

4   numbers;

5   B)   the dynamics manager causes the data change requests to be processed

6   in an order dependent on the endpoint relative sequence numbers and the

7   endpoint numbers; and

8   C)   the dynamics manager causes data changes to be ~~rolled back~~ <u>undone</u>

9   and remade responsive to the dependency identifier.

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1   12.   (Presently Amended) A distributed, coordinated system for maintaining plural
2   copies of the same data pursuant to a distributed data model, wherein the copies
3   can be changed responsive to users' actions, the system comprising:
4   A)   a plurality of computer systems, each of the computer systems capable of
5   locally generating a plurality of data change requests for changing a local
6   copy of the data and of executing data change requests including the
7   locally-generated data change requests and remotely-generated data
8   change requests generated by others of the computer systems so as to
9   make the requested changes to the local copy of the data;
10   B)   each of the computer systems including a dynamics manager that
11   receives locally-generated data change requests and remotely-generated
12   data change requests for determining, responsive to information contained
13   in the locally-generated and remotely-generated data change requests, an
14   order in which requested changes are made to the local copy of the data,
15   for making requested data changes in the determined order, for ~~rolling-~~
16   ~~back~~ underlined undoing data changes made when a remotely-generated data
17   change request is received out of the determined order underline to the point where
18   underline a data change corresponding to the out-of-order data change request can
19   underline be made in the determined order and for remaking ~~requested~~ underline undone data
20   changes in a new order.

1   13.   (Original) The system in accordance with claim 12, wherein the dynamics
2   manager of each computer system is responsive to data dependency information
3   and request sequence information recorded in the data change requests in
4   determining the order in which the requested changes are made to the local copy
5   of the data; the data dependency information comprising an indication of at least
6   one prior data change request on which the data change request depends; and
7   the request sequence information indicating a sequential position of the data
8   change request among a plurality of data change requests generated by the
9   computer system that generated the data change request.

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1   14.   (Presently Amended) A framework apparatus for providing communication

2   services for an activity-based collaboration system in which data change

3   requests comprising deltas are communicated over a network between network-

4   capable devices in order to maintain consistency between local data copies, the

5   framework apparatus comprising a communications manager operable on a local

6   network capable device for sending locally-generated deltas over a network to at

7   least one remote network-capable devices and for receiving remotely-generated

8   deltas from the at least one remote network-capable device; and a dynamics

9   manager responsive to dependency information contained in the deltas for

10   determining an order for processing the deltas to make changes to each local

11   data copy, the dynamics manager being responsive to the reception of a

12   remotely-generated delta out of the determined order for causing the selective

13   rollback undoing of changes made to a local data copy, the making of a data

14   change corresponding to the out-of-order delta and the selective remaking of the

15   rolled-back undone data changes in a new order.

1   15.   (Presently Amended) A method for providing communication services for an

2   activity-based collaboration system, in which data change requests comprising

3   deltas are communicated over a network between network-capable devices in

4   order to maintain consistency between local data copies, the method comprising

5   the steps of:

6   A)   sending locally-generated deltas from a local network-capable device over

7   a network to at least one remote network-capable devices and for

8   receiving remotely-generated deltas from the at least one remote network-

9   capable device;

10   B)   determining an order for processing the deltas based on sequence

11   information contained within the deltas;

12   C)   processing the deltas in the determined order thereby making changes to

13   a local data copy as requested by the deltas;

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14		D)	~~rolling back~~ <u>undoing</u> requested changes made to the local data copy in
15			response to sequence information contained within the deltas indicating
16			that a remotely-generated delta has been received out of the determined
17			order; ~~and~~
18		E)	<u>making a data change to the local data copy corresponding to the out-of-</u>
19			<u>order delta; and</u>
20		<u>F)</u>	remaking the ~~rolled-back~~ <u>undone</u> data changes in a new order.

Claim 16 (Canceled).

Claims 17-34 (Withdrawn).

1	35.		(New) A method for processing data change requests in a network-capable
2			device having a local data copy and data change means for generating data
3			change requests, each data change request specifying a change to be made to
4			the local data copy, wherein the network-capable device communicates over a
5			network with at least two other network-capable devices to enable all network-
6			capable devices to cooperatively edit the same data during an editing session,
7			the method comprising:
8		(a)	when a first and second received data change requests require that a third
9			data change have previously been made to the local data copy,
10			determining an order of making the data changes as specified by the first
11			and second data change requests based on information contained in the
12			data change requests;
13		(b)	when a change specified by one of the first and second data change
14			requests cannot be made in the order determined by the data change
15			requests because other changes have already been made to the local
16			data copy, undoing the other changes to the local data copy;
17		(c)	making a change to the local data copy as specified by the one data
18			change request; and

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19		(d)	redoing data changes undone in step (b) so that data changes are made
20			to the local data copy consistently with changes made to local data copies
21			in all network-capable devices.

1   36.   (New) The method of claim 35 wherein step (a) comprises:

2   (a1)   when a first and second received data change requests require that a third

3   data change have previously been made to the local data copy and the

4   third change has not been made, placing the first and second received

5   data change requests in a holding queue for subsequent processing.

1   37.   (New) The method of claim 36 wherein step (b) comprises:

2   (b1)   when the changes specified by the first and second data change requests

3   can be made in the order determined by the data change requests making

4   the data changes specified by the data change requests in the determined

5   order.

1   38.   (New) The method of claim 37 further comprising:

2   (e)   determining whether changes to the local data copy specified by data

3   change requests in the holding queue can be made.

1   39.   (New) The method of claim 38 wherein the information in the data change

2   requests comprises an order in which each of the network-capable devices

3   joined the editing session.

1   40.   (New) The method of claim 35 wherein the information in the data change

2   requests further comprises a sequence number for each network-capable device.

1   41.   (New) The method of claim 35 further comprising:

2   (e)   placing information for each change made to the local data copy in a data

3   change log; and

4   (f) using the information in the data change log to undo changes to the local

5   data copy.

1 42. (New) The method of claim 41 further comprising:

2   (g) after each data change has been made, updating a timestamp vector

3   comprising a data change sequence number for each endpoint.

1 43. (New) The method of claim 42 wherein step (a) comprises:

2 (a2) when a first and second received data change requests require that a third data

3   change have previously been made to the local data copy, using the timestamp

4   vector to determine whether the third change has been made.

1 44. (New) Apparatus for processing data change requests in a network-capable

2   device having a local data copy and data change means for generating data

3   change requests, each data change request specifying a change to be made to

4   the local data copy, wherein the network-capable device communicates over a

5   network with at least two other network-capable devices to enable all network-

6   capable devices to cooperatively edit the same data during an editing session,

7   the apparatus comprising:

8   when a first and second received data change requests require that a third

9   data change have previously been made to the local data copy, means for

10   determining an order of making the data changes as specified by the first and

11   second data change requests based on information contained in the data change

12   requests;

13   when a change specified by one of the first and second data change

14   requests cannot be made in the order determined by the data change requests

15   because other changes have already been made to the local data copy, means

16   for undoing the other changes to the local data copy;

17   means for making a change to the local data copy as specified by the one

18   data change request; and

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19   means for redoing undone data changes so that data changes are made
20   to the local data copy consistently with changes made to local data copies in all
21   network-capable devices.

1 45. (New) The apparatus of claim 44 wherein the means for determining an order of
2   making the data changes comprises:
3   a holding queue; and
4   means operable when a first and second received data change requests
5   require that a third data change have previously been made to the local data
6   copy and the third change has not been made, for placing the first and second
7   received data change requests in the holding queue for subsequent processing.

1 46. (New) The apparatus of claim 45 further comprising means operable when the
2   changes specified by the first and second data change requests can be made in
3   the order determined by the data change requests for making the data changes
4   specified by the data change requests in the determined order.

1 47. (New) The apparatus of claim 46 further comprising means for determining
2   whether changes to the local data copy specified by data change requests in the
3   holding queue can be made.

1 48. (New) The apparatus of claim 47 wherein the information in the data change
2   requests comprises an order in which each of the network-capable devices
3   joined the editing session.

1 49. (New) The apparatus of claim 44 wherein the information in the data change
2   requests further comprises a sequence number for each network-capable device.

1 50. (New) The apparatus of claim 44 further comprising:
2   means for placing information for each change made to the local data
3   copy in a data change log; and

4   mean for using the information in the data change log to undo changes to

5   the local data copy.

1   51.   (New) The apparatus of claim 50 further comprising means operable after each

2   data change has been made for updating a timestamp vector comprising a data

3   change sequence number for each endpoint.

1   52.   (New) The apparatus of claim 51 wherein the means for determining an order of

2   making the data changes comprises means operable when a first and second

3   received data change requests require that a third data change have previously

4   been made to the local data copy for using the timestamp vector to determine

5   whether the third change has been made.